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GABRIEL G. ALEXANDER, P.E., being duly sworn, deposes and says:

- 1. I am a professional engineer, licensed in the states of Ohio and Pennsylvania. I earned a Bachelor of Science degree in Mechanical Engineering from the University of Houston. For over twenty years, I worked as a design engineer in the private sector, with a particular emphasis in engineering functions relating to trucks and trailers. My work includes the design and testing of truck and trailer components as well as the maintenance, instructions and product warnings for them. All of my past work experiences included the selection of appropriate materials for the construction of the products that I designed which includes wire ropes for both static or stationary and dynamic applications. I am presently an Associate at Robson Lapina, Forensic Engineers, Architects, Scientists & Fire Investigators, where I specialize in the technical investigation and analysis of accidents involving heavy vehicles (including tractors and trailers), mechanical engineering, and crash reconstruction.**
- 2. As part of the specialized knowledge, education, training, experience, and skill that I have with regard to the incident matters are:**
 - i. A BSME degree in Mechanical Engineering which**

includes classes and/or training in metallurgy, material selection, failure analysis, analysis of static and dynamic structures, product design, stress analysis including stress concentration factors, instructions, warnings, and product safety.

- ii. The actual design of a truck/trailer component that utilized wire rope along with specialized hoisting devices used in the manufacturing of vehicles that I designed.
- iii. Over 20 years of engineering experience which included failure analysis, failure prevention, material selection, product testing, safety engineering, static and dynamic analysis, stress analysis including stress concentration factors, instructions, warnings, and product design.
- iv. My experience includes the design, and manufacture of commercial motor vehicles of the same class as the incident vehicle. Further, this is not the first case at Robson Lapina that I have had which involved auto carriers, and I have testified on several occasions with regard to falls from a wide variety of vehicles.
- v. My safety training and experience included the proper use of Failure Modes and Effects Analysis.
- vi. My training is not limited to a bachelor's degree as I have

several advanced classes. Further, I did not concede that I have no training with regard to wire rope or metallurgy. I specifically stated that I am not a Metallurgist, meaning I did not get my degree in Metallurgy, but I do have training in this area, in particular with regard to failure analysis and material selection.

3. I have authored a report dated 3/24/2003, and was deposed on 5/13/2003.
4. Information that I relied upon as part of my analysis includes specific engineering design principals and standards and regulations from the American National Standards Institute (ANSI), The National Safety Council, The US Department of Transportation, and The Federal Highway Administration. I also relied upon authored textbooks that are authoritative in mechanical engineering including, The Standard Handbook of Machine Design, Industrial Safety, Engineering Design for Safety, Metallurgy of Failure Analysis, and Stress Concentration Factors. I also relied on my personal copy of the Tiger Brand Wire Rope Engineering Hand Book, as well as information from the Associated Wire Rope Fabricators. As part of my research I incorporated information from three internet web sites. Summarizing I referenced 15 specific

documents which are all authoritative with regard to the issues involved in this incident.

5. The engineering principals and standards I detailed in my report, and that the defendants violated in the design and use of the incident safety cable on the incident vehicle are specific to the design of the safety cables that failed causing this incident.
6. I have since received a report dated 6/9/2003 from Sauer Engineering and Motions to exclude, from Allied Systems Ltd and Hanes Supply Inc.
7. Defendant Hanes' motions rely in part on the report of Sauer Engineering.
8. It is interesting to note that the first three paragraphs in the Introduction section of the Sauer report basically plagiarize the first three paragraphs of my report.
9. Sauer performed no analysis on the stainless steel exemplar because according to Sauer, "It was not stainless steel and has no relevance to this failure."
10. The Sauer report relies on wire rope information provided in my report and that obtained from 7 internet web sites.
11. Sauer states that safety cable at issue will see minimal stress from the driver's hand and from wind loading. Sauer does not consider that the cables are located at the upper outboard

corners of the vehicle and thus will be subject to loading from trees and other objects. This is generally well understood by engineers involved in the design of trucks and trailers.

12. The USS Steel Tiger Brand Wire Rope Engineering Hand Book states that galvanized wire rope should be limited to stationary installations. The loading criteria proposed by Sauer and myself on the safety cables is considered dynamic loading in the field of mechanical engineering. Further, considering that the safety cables are on a moving motor vehicle disqualifies it as a stationary installation, it is a dynamic system.
13. Sauer mentions that coating thickness and/or excessive swaging pressure can or could reduce the cables working life but states that "neither of the potential problems can be identified or verified."
14. Sauer states that when feasible it is preferred to analyze the broken parts in question but that a "fallback position" is or can be the use of video and photographic documentation. I agree.
15. I utilized photographic documentation as part of my investigation.
16. Sauer stated that his ability to conduct a proper investigation was limited and that the available photographs of the incident cable are insufficient for him to support any reliable conclusions as to the cause of the failures. Further, Sauer stated that he would

need the service history of the vehicle even that of the exemplar cable for him to reliably conclude with regard to the failures. Finally, Sauer states that further testing of the failed exemplar may reveal useful information but does not say that it will. Having said that he is unable to support reliable conclusions, Sauer offers the following conclusions anyway:

- The selection of the material for the design and manufacturing method was reasonable and the product was appropriate for the intended use.
- The absence of the failed part in conjunction with poor photographic documentation of the failure makes an engineering analysis of this situation impossible to perform.
- The use of an exemplar cable in this case as representative of the actual failed unit is invalid for the following reasons:
 - The service history of the cable is unknown. No correlation can therefore exist in trying to compare actual condition for the failed unit.
 - Only one cable was analyzed. It is not known if this is representative

of normal service usage or special circumstances.

- No substantial analysis of the failure mechanism was performed to provide any correlation to the failure mechanism as cited or the actual circumstances of the actual failed part.

17. The Federal Highway Administration (FHWA) is part of the United States Department of Transportation (DOT). The agency has the authority to issue regulations that regulate the use of commercial motor vehicles, specifically the authority to issue Federal Motor Carrier Safety Regulations (FMCSRs) which are applicable to motor carriers, commercial motor vehicles and their operators. Operators of commercial vehicles are professional drivers and are required, by the Federal Motor Carrier Safety Regulations, to have training, be qualified, and have a Commercial Drivers License. The minimal federal requirements for driver qualification and training applicable to this investigation are covered under 49 CFR 383, and 49 CFR 392.

18. The FMCSR's are not recommended practices. They are minimal

requirements. These regulations apply to commercial drivers, and to motor carriers and employers who employ commercial drivers as specified in the requirements:

49 CFR 383.1 Purpose and scope.

The purpose of this part is to help reduce or prevent truck and bus accidents, fatalities, and injuries by requiring drivers to have a single commercial motor vehicle driver's license and by disqualifying drivers who operate commercial motor vehicles in an unsafe manner.

49 CFR 383.3 Applicability.

The rules in this part apply to every person who operates a commercial motor vehicle (CMV) in interstate, foreign, or intrastate commerce, to all employers of such persons, and to all States.

19. Evidence from Allied as outlined in my report (p. 22, 23, 24, 25) reveals that only the worst cables were replaced in particular when insufficient cables were on hand. Further, not all the cables were replaced on the incident unit. The FMCSR's require that all the safety devices be functional at all times, and not just some of them. My opinion that Allied did not properly maintain the incident vehicle is base on the violations of the

FMCSR as stated above and in my report. Further, the memos I review with regard to the safety meetings show that drivers were not warned with regard to swelling cables and this is improper. It is clear that there was a "system wide effort to replace them all", referring to the cables. It is also clear that this system failed Ferguson and that failure along with the defective condition created by the other defendants, caused Ferguson to become injured.

20. My methodology was to analyze the evidence provided with regard to this incident and compare the incident design to known accepted engineering principals and standards from sources that are peer reviewed and authoritative in the field of vehicle design, failure analysis, metallurgy, wire rope design, government regulations, engineering, safety engineering. This is the generally accepted methodology utilized in the investigation of incidents like the subject incident.
21. This is my first case involving wire rope, however as I stated in my deposition I have worked many cases involving falls from vehicles and the design principals are similar. (p. 11) Further, I have worked on falls from car haulers, as well as other cases involving other issues on car haulers.
22. It is my position that Galvanized wire rope is acceptable for outdoor

use on static applications, and I supported this with a peer reviewed document from a wire rope manufacturer, namely United States Steel. The incident vehicle is not a static application and therefore the use of the galvanized cable, as utilized was improper. This is not a contradiction as stated by defendants, and I did provide scientific support for this opinion.

23. I have reviewed both parts of the failed exemplar and my opinions remain unchanged. The photographs of the incident vehicle reveal that there is a small portion of wire rope still attached to the swaged fitting which is exactly what the exemplar exhibits. Further, if defendants and their expert feel that the photographs of the incident failure are not sufficient for them to make a comparison to the exemplar how is it that they can say the incident cable and the exemplar are not alike "bears no known resemblance"? If they can not tell then they should not tell one way or the other. Yet they did which is improper and not scientific.

24. Just because it is impossible for defendants expert to perform analysis does not mean that it is impossible for me. I did perform scientific analysis and I did support my opinions with peer reviewed scientific references that are authoritative in the area of engineering. What is most troubling is that Sauer

states that there is an absence of foundation for him to opine, yet he still opinions that there is nothing wrong with the design. This is the same flawed logic, and improper engineer that led to the inappropriate use of the incident wire rope configuration in the first place. Had this pattern of abuse been stopped and appropriate engineering principals applied this incident does not occur.

25. The photographs of the incident failure that I reviewed were sufficient for the analysis that I needed to offer the opinions I offered. Further, I have performed this type of analysis on several other trailer component failure cases, and I have testified in other matters based on similar work and methodology performed in this case. Thus, the methodology used in this case has been utilized on several other cases and is generally accepted as scientific in the field of engineering for this type of incident. Again, I relied upon several peer reviewed publications and journals that are all scientifically reliable, as was my methodology.
26. Defendants are critical of the fact that I am not a metallurgist and for not consulting one. I did refer to a peer reviewed document authored by A.W. DAS namely Metallurgy of Failure Analysis. refer to page 21 of my report which states that corrosion,

oxidation, pitting and intergranular corrosion are defects that cause dimensional deviation stress concentrations and reduces strength and fatigue resistance. This is exactly what I found as a result of my analysis and discuss in my report.

27. Defendants state that I have not worked in the field, and nothing could be further from the truth. My opinion is that field of engineering involved in this case is vehicle engineering and the incident wire rope was utilized in the design of component for a vehicle that was certified by defendants as being safe, namely a safety cable. Further, it is my opinion that the material selected for the design was improper.
28. I am not alleging a manufacturing defect such as an improper coating thickness or an improper swage. Regardless of the coating thickness or the swaging pressure the use of galvanized wire was improper for a ten year life even if both the coating and swage were perfect and the defendants knew this prior to the incident and testified that they knew. Further, the use of the incident swaged fitting created the deadly combination as reported by DAS and I that lead to the failures experienced with the design and led to this incident. This is peer reviewed and the numerous failures at Allied demonstrate the repeatability of the failure.

29. As stated in my deposition the life for galvanized components used in vehicles is 3 to 5 years. I did not suggest bright wire as a potential solution for this mater and did not comment on its useful life, nor do I intent to. The useful life of galvanized metal is well known to vehicle engineers and is known to me based on past testing and knowledge. Refer to SAE J1617(Body Corrosion), SAE J1293(Under Vehicle Coupon Corrosion Tests), SAE J447(Prevention of Corrosion of Motor Vehicle Body and Chassis Components), Automotive Corrosion and Protection by R. Baboian published by NACE 1991, and Stress Corrosion Cracking by Uglansky & Payer published by ASTM 1977.

30. Defendants misstate the facts with regard to my use of stress concentration factors. I utilized a text by Peterson my report reference #15 which is authoritative in the field. The criteria needed to determine the stress concentration is not the area of wire rope and thus the area and air gaps that defendants make much to do about is not important, nor is it relevant. What is important is the diameter of the swaged fitting, the diameter of the wire rope, and the radius of the transition between. See my Attachment 1. I measured the diameter of the swage by accepted methodology, and I measured the diameter of the

wire rope by the methodology utilized in the wire rope industry as can be seen on page 9 of 10 of my deposition exhibit 3, my Attachment # 2, from the Wire Rope Corporation of America and Attachment 3 from United States Steel. Defendants state that I treat the wire rope as if it were one solid piece which is yet another misstatement of the facts. I treat both as proper engineering dictates, and there is nothing improper about anything that I did. This is why it is important to allow an engineer with specialized training, experience, and training explain these issue to the jury rather than defendant attorneys who are obviously untrained in the engineering areas involved in this mater.

31. I do not contradict the science of the industry, and my opinions are supported by the publications I referenced. Further, I did consult pertinent technical publication as shown in my report and listed above. I did not compare the corrosion rates of untreated cable to that of galvanized cable as this comparison was not important to the opinions I offered.
32. Defendants also want to have my statement: "No explanation has been provided as to why the design change was made. Further, absent a defective condition there would have been no reason for CCI and/or Hanes to change the design." ruled

inadmissible based on federal rule 407. This too is flawed as the changes that I am referring to occurred prior to the incident, and not subsequent to the incident. Further, for my statement to be flawed logically, the defendants would have to agree that the incident design was in fact defective.

33. Defendants make much to do about testing that I could have done, but did not. First of all testing would be important if I were saying that the coating thickness was improper, but I am not. Secondly testing would also be important if I offering opinions that the swage was performed improperly, but again I am not. There is no physical evidence, testimony, or opinions from any expert to support either of the above manufacturing defects. Further, defendants in my opinion want to make the cause of this incident appear to have been caused by one or two above so as to divert attention from the defective design they introduced and allowed to exist on the day of this incident. They may see this as a manufacturing defect that caused a material failure, even though Sauer expert for defendant Hanes does not, but I do not. In my opinion this is a design defect and stainless steel cable would prevent it.

34. Yet another improper conclusion is drawn from defendant Hanes with regard to the Spelter Wire rope Sockets. As I testified

W. J. Spelter